Appendix I
Methodology Notes

Throughout this report, various references are made to state and local population data used to calculate the Disparity Indexes (DIs) for different racial and ethnic groups involved in traffic stops. Additionally, stop DIs for individual agencies are calculated differently from DIs calculated for geographic regions such as a "local area" depicted in map Figures 14–16. This appendix provides an explanation of the population data used and the DI calculations for geographic regions made in this report.

Census Data used to Calculate Traffic Stop Disparity Indexes

Data Source: National Center for Health Statistics. Vintage 2020 post-census estimates of the resident population of the United States (April 1, 2010, July 1, 2010–July 1, 2020), by year, county, single-year of age (0, 1, 2... 85 years and over), bridged race, Hispanic origin, and sex. Prepared under a collaborative arrangement with the U.S. Census Bureau. Available from: www.cdc.gov/nchs/nvss/bridged_race.htm as of September 22 2021.

The National Center for Health Statistics (NCHS) bridged-race population estimates for counties and cities are currently the only U.S. Census-based population estimates available by both single year of age and the 4–race groups and 1–ethnicity collected in the Virginia traffic stop data for the year 2020. Single year of age was needed to calculate populations age 15 and older by race and ethnicity; these are in turn used to calculate driver stop DIs. Bridged-race population estimates for calendar year 2020 were used because they were the most recent available as this report was being prepared.

The NCHS bridged-race population estimates are based on inter-census estimates produced by the U.S. Census Bureau, with base populations sourced from the 2010 decennial census. The base decennial population is adjusted with vital statistics (births and deaths) and migration data for each year to produce each annual estimate.[1] The Census produces population estimates for Virginia counties alone as well as an aggregated population estimate for Virginia counties that includes the population of towns located within the geographic boundary of the county (if a county has no towns located within its borders, then the county population alone is equal to the aggregated county population). The aggregated county population estimate serves as the basis for the bridged-race county population estimates produced by NCHS. NCHS does not produce bridged-race population estimates by age–race–ethnicity for Virginia towns, so there is no way to subtract town age–race–ethnicity population from the aggregated county age–race–ethnicity population data[2]. This means that the population used to calculate stop DIs for some Virginia county agencies includes town populations.

[1] See the Census Bureau's Vintage 2020 population estimates methodology notes for details: https://www2.census.gov/programs-surveys/popest/technical-documentation/methodology/2010-2020/methods-statement-v2020-final.pdf

[2] The IPUMS National Historical Geographic Information System (NHGIS) produces disaggregated Census Bureau American Community Survey (ACS) datasets which provide age, race, and ethnicity counts for town populations. However, they have cited COVID-related delays in releasing the ACS 2015-2020 dataset and it is not available at the time of writing this report. In future years, DCJS will utilize IPUMS NHGIS data to develop town-level DIs should their ACS release schedule meet the timing constraints of the CPA report deadline.

Removing Incarcerated Populations from Estimates

To improve the precision of population benchmarks utilized for developing locality disparity indices, DCJS acquired annual race-aggregated incarceration facility population data (single day count from June 30, 2021) from the Virginia Department of Corrections to remove these populations from the estimated pool of potential drivers in each facility's jurisdiction.

Following US Census methodology, the NCHS estimates count incarcerated individuals as residing in the city or county where their incarceration facility is located. For the purposes of this report, including these individuals in population benchmarks leads to an overestimate in the number of potential drivers in facility jurisdictions and can especially overstate the proportion of non-white potential drivers. After collecting the NCHS age-restricted counts for each city and county by race, DCJS removed the VADOC aggregated incarceration counts for each race/ethnicity from cities and counties with an incarceration facility, effectively removing roughly 24,000 incarcerated individuals from driver estimates. All Disparity Indices and analyses based on population estimates in the 2022 report use these incarceration-adjusted counts.

While this adjustment does not subtract enough individuals from the state estimates as a whole to impact the statewide findings, jurisdictions with a large proportion of their Census count drawn from incarceration facilities *and* racial disparities in their incarceration rates compared to the general adult population experience shifts in disparity indices when incarcerated individuals are removed. For example, a county with a large proportion of incarcerated black individuals and a small overall population will have a relatively lower black driver count estimate—and corresponding higher black driver DIs—when you subtract incarcerated individuals from the estimates.

COVID-19 Estimation Considerations

Note that compared to prior survey years, 2020 was uniquely impacted by population estimation complications during the peak of the COVID-19 pandemic. The US Census Bureau declined to release their standard 2020 Single Year ACS Population Estimates, indicating the presence of nonresponse bias in which "higher socioeconomic status households became relatively more likely to respond during the pandemic."[3] The Census Bureau instead released an "experimental" dataset utilizing external administrative data sources and respondent weighting methods to address sampling bias issues brought on by COVID. Because the NCHS dataset does not utilize 2020 decennial census, 2020 Single Year ACS data or any similar citizen sampling survey conducted in the year 2020, its COVID-related accuracy challenges are based upon different estimation methods. Specifically, the Census Bureau applied new and provisional data sources to the Vintage 2020 data to offer more recent estimates of the impact of COVID on migration, births, and deaths.[4] Any variation in estimates caused by the introduction of these new data sources (rather than COVID impacts) constitutes sampling error in the 2020 estimates.

Given the bridged race format of the NCHS data, their incorporation of COVID-related death and migration estimates, and the universality of COVID-related sampling issues across all population surveys in 2020, DCJS maintains that this data source is the most feasible option compared to either falling back

[3] https://www.census.gov/content/dam/Census/library/working-papers/2021/acs/2021_Rothbaum_01.pdf

[4] See the Census Bureau's Vintage 2020 population estimates methodology notes for details: https://www2.census.gov/programs-surveys/popest/technical-documentation/methodology/2010-2020/methods-statement-v2020-final.pdf.

on prior year estimate data from 2019 or utilizing another 2020 population data source which lacks bridged-race variables but is prone to the same bias.

Disparity Index Calculations for Virginia State Police Maps with Stops, Searches, and Driver Arrests by Driver Race

VSP stop DIs were calculated using the formula described in section Statewide Disparity Index (DI):

$$\frac{\text{Group's percentage of all stops reported by VSP statewide}}{\text{Group's percentage of population age 15+ statewide}}$$

The group's percentage of all stops reported is the percentage of driver stops for individuals age 15 and older by race or ethnicity as reported statewide by VSP.

The group's percentage of population age 15+ is the total population age 15 and older statewide by race or ethnicity statewide.

It should be noted that the VSP statewide traffic stop DIs may be subject to more variability than traffic stop DIs calculated for local LEAs. This is because VSP often patrols interstate highways, which are more likely to be traveled by transient, out-of-state drivers, who are not included in the Virginia population age 15+ used in the calculation.

Disparity Index Calculations for Local Area Maps with Stops, Searches, and Driver Arrests by Driver Race for Local Law Enforcement Agencies

Local area DIs were calculated using the *sum* of stops (or the sum of stop details like searches or driver arrests) submitted by all city, county, or town agencies that reported traffic stops within the geographic boundary of the city or county.

For example, if both a PD and SO reported stops within City X, the total number of stops (or searches or driver arrests) from both agencies along with the City X bridged-race population age 15+ were used to compute the local area DI for City X.

Similarly, if a SO and two town PDs reported stops (or searches or driver arrests) within the geographic boundary of County Y, the total reported by all three agencies along with the County Y bridged race population age 15+ (which includes the population for the towns) were as used to compute the local area DI for County Y.

Once the total number of stops is determined for a local area, the DI is calculated using the formula described in section *Statewide Disparity Index (DI):*

$$\frac{\text{Group's percentage of all stops reported for the local area}}{\text{Group's percentage of population age 15+ for the local area}}$$

Similarly, once the total number of searches or driver arrests is determined for a local area, the DI is calculated using the formula described in section *Statewide Disparity Index (DI):*

$$\frac{\text{Percent of drivers in each group for searchers or driver arrests for the local area}}{\text{Group's percentage of all stops reported for the local area}}$$